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CITY OF BOSTON

Report No. 10

SEWER DIVISION

OF THE

PUBLIC WORKS DEPARTMENT

January 1, 1949

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GRIFFENHAGEN & ASSOCIATES

CONSULTANTS IN PUBLIC ADMINISTRATION AND FINANCE

CITY OF BOSTON

Report No. 10

SEWER DIVISION

OF THE

PUBLIC WORKS DEPARTMENT

January 1, 1949

PUBLIC

Prepared by
Griffenhagen & Associates
Consultants in Public Administration and Finance

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Boston Finance Commission
Sept 14, 1959

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G R I F F E N H A G E N & A S S O C I A T E S

(Established 1911)

Consultants in Public Administration and Finance

Boston 8
January 1, 1949

The Honorable,
The Chairman and the Members
of the
Finance Commission of the City of Boston
24 School Street
Boston 8, Massachusetts

Dear Sirs:

Presented herewith is our report No. 10 covering the Sewer Division of the Public Works Department.

Yours faithfully,

Griffenhagen & Associates

Griffenhagen & Associates

SUMMARY OF FINDINGS

The sewer division is one of the five principal divisions of the public works department. As of October 1, 1948, there were 244 employes assigned to the division. In 1947 the division spent $1,421,653 of which the sum of $547,932 was for maintenance and $873,721 was for new construction.

The sanitary sewage and the surface water drainage of the City of Boston are discharged into Boston harbor through three sewer systems two of which are under the control of a state agency, the Metropolitan District Commission. The third system, known as the Boston main drainage system, is under the control of the sewer division of the public works department.

The engineering force of the sewer division is decentralized to a greater extent than seems advisable and the organization structure of the division requires considerable consolidation to relieve the division engineer of many of the routine details of operation to which he now gives his personal attention. Currently, twelve subordinates report direct to the division engineer.

The engineering and construction inspection payroll cost is excessive in relation to the amount of capital improvements that the division has completed in the post-war period to date. The number of employes engaged in these activities can be justified, however, if the division completes during the next ten years the capital outlay program that it has on paper.

Sewer cleaning in the Boston main drainage system has been neglected over a period of years to the point that the interceptor sewers are not carrying the volume for which they were designed and an accelerated program of removing silt and other deposited material from the interceptors is necessary.

The maintenance crews operating from five district yards devote an excessive amount of time to the freeing of private drains. The division has established a charge of $15.00 for this service although in the majority of instances, no attempt or only half-hearted attempts are made to collect this fee. The current policy appears to be to make the charge on a basis of ability to pay.

The principal pumping station operated by the division at Old Harbor Point, popularly known as the Calf Pasture on Dorchester Bay is obsolete and expensive to operate. Plans of the division call for replacement of this pumping station with a new structure and with a sewage treatment plant.

The City of Boston contemplates the treatment of its sewage before discharge of the effluent into the harbor, the practice that is now being followed. The Metropolitan District Commission has been granted enabling legislation for the construction of sewage treatment plants at both of its discharge outlets. The construction of one of these plants is now under way.

The sewer division has been slow to adopt the use of power-operated sewer cleaning equipment. A policy of contracting for a substantial amount of catch basin cleaning has been followed. The purchase of additional power-operated sewer cleaning and catch basin cleaning machines should permit a greater volume of cleaning by day labor forces.

Many of the tidal gates and overflows that are a part of the main drainage system are in need of replacement. Leakage of salt water into the interceptors is excessive, a condition that places an additional load on the pumps at the Calf Pasture Pumping Station and results in the failure of the system to properly drain the areas.

Although many of the recommendations contained in this report cover matters of organization and policy and cannot be evaluated, it is believed that the adoption of the recommendations would result in annual savings of over $100,000. However, it is also recommended that these savings be used to step up the long neglected cleaning of interceptor sewers.

SUMMARY OF RECOMMENDATIONS

The principal recommendations expressed or implied in Report No. 10 on the sewer division of the public works department are summarized below:

1. Reorganize the division of sewers along functional lines and reduce the number of subordinates who report direct to the division engineer from twelve to five. (Section 3c)

2. Consolidate all engineering activities under one person who would also act as division engineer in the absence of the division engineer. (Section 3c)

3. Reduce by two the number of positions in the maintenance inspection unit of the division and assign three cars for the use of this unit so that inspectors are not dependent on public transportation and so that the smaller unit can carry the workload. (Section 3f, 5c)

4. Modify the visible card index that is maintained of sources of supply of materials purchased to eliminate vendors' names and dates of invoice payments and use this index for centralized inventory control and for the accumulation of material cost figures. (Section 3g)

5. Discontinue the practice of keeping encumbrance records in the division office and obtain information as to encumbrances against budgetary accounts from records of the city auditor. (Section 3g)

6. Study the present method of keeping cost figures to streamline the system and to eliminate the preparation of statistics that have little practical value. (Section 3g)

7. Transfer the supervision of the testing laboratory to the proposed engineering section. (Section 3h)

8. Transfer the blueprinting and reproduction unit from the sewer division to the central office of the public works department. (Section 3i)

9. Assign a full day's work to sewer maintenance crews to eliminate the time lost by crews traveling to the yard for additional assignments. (Section 3j)

10. Consolidate the main drainage unit with the district forces. (Section 3k)

11. Reduce the staff of the Calf Pasture pumping station by five positions. (Section 3l)

12. Provide better facilities at the district yards for the comfort and convenience of employes. (Section 4j)

13. Assign one station wagon and driver to transport crews of each shift to the Calf Pasture Pumping station and to the Moon Island storage basins in lieu of the separate station wagon for each. (Section 4k)

14. Purchase two additional catch basin cleaning machines, clean all catch basins with city forces, and discontinue the practice of letting out part of this work on contract. (Section 4k)

15. Purchase additional power-operated sewer cleaning machines so that one unit may be assigned to each district yard. (Section 4l)

16. Review the assignment of manually-operated cleaning devices to the district yards to determine that sufficient equipment has been assigned to permit the proper equipping of each truck and district crew. (Section 4l)

17. Review the adequacy and efficiency of testing laboratory equipment to determine new equipment requirements. (Section 4m)

18. Prepare a written manual of organization and procedures and distribute copies to employes in managerial, supervisory, and key positions. (Section 5a)

19. Provide for a uniform policy on flushing private house drains and assess a flat charge of approximately $7.50 for each flushing without provision for guarantee or refund. (Section 5b)

20. Assign to maintenance inspectors the initial responsibility of investigating complaints of flooded drains and dispatch a district crew to free public sewers if the report of the inspector indicates that blockage exists. (Section 5c)

21. Reduce the size of catch basin cleaning crews from three to two employes. (Section 5d)

22. Take steps to amend Chapter 511 of the Acts of 1945 to increase the amount that benefiting property owners may be assessed of the cost of constructing new sewers and drains. (Section 5e)

23. Initiate a program of replacing inefficient side hung tidal gates with gates of improved design to cut down the leakage of salt water into the Boston main drainage system. (Section 6b)

24. Initiate a program to clean the interceptor sewers and restore their carrying capacity to that for which they were originally designed. (Section 6c)

25. Transfer jurisdiction of the interceptor sewers and disposal facilities of the Boston main drainage district to the Metropolitan District Commission. (Section 8)

26. Conduct a study to determine an equitable basis of assessment of the cost of maintaining the interceptors and the disposal facilities of the Boston main drainage system upon the City of Boston and upon the other communities in the metropolitan area. (Section 8)

27. Carry out the proposed capital improvement program. (Section 9b)

28. Expedite the construction of the proposed treatment plant. (Section 9b)

29. Attempt to hold maintenance costs to $500,000 ~~a~~ $600,000 a year by having the chief engineer make a detailed examination of costs while at the same time developing and carrying out a sewer and catch basin cleaning program. (Section 9c)

SEWER DIVISION
of the
PUBLIC WORKS DEPARTMENT

1. Introduction

The sewer division of the public works department is one of the five divisions of the department, the other divisions being sanitary, highway, water, and bridge and ferry. As of October 1, 1948, there were 244 employes in the division of whom 231 were permanent and 13 were temporary employes.

The sanitary sewage and the surface water drainage of the City of Boston is discharged into the waters of Boston harbor through three sewerage systems. These are the Boston main drainage system, the north metropolitan system and the south metropolitan system. The Boston main drainage system is under the control of the sewer division of the public works department; the interceptor sewers and discharge outlets of the metropolitan sewerage systems are under the control of the Metropolitan District Commission, an agency of the Commonwealth of Massachusetts.

The Boston main drainage system receives the sewage discharge from the City proper, South Boston, and parts of Roxbury, West Roxbury, and Dorchester. The system outlets into Boston harbor off Moon Island.

The north metropolitan system receives the sewage discharge from Charlestown and East Boston, and outlets into Boston harbor south of Deer Island.

The south metropolitan system receives the sewage discharge from Brighton, Hyde Park, and parts of West Roxbury, Back Bay, Roxbury, and Dorchester, and outlets into Boston harbor off Nut Island.

Annual metropolitan sewerage assessments are levied against the City on a valuation and population basis and Boston receives payment annually from the state for disposing of sewage from a small part of the south metropolitan district under a contract renewable every five years.

2. Functions and Activities

The sewer division of the public works department is responsible for the disposal of household, commercial, and industrial liquid wastes and storm water run-off for the protection of public health and for the convenience of the community.

In the discharge of this responsibility, the division maintains over 1264 miles of common and intercepting sewers and over 22,835 catch basins. The Boston main drainage system which was constructed during the period from 1877 to 1884 consists of 24.1 miles of intercepting sewers, a pumping station located at what is known as the Calf Pasture at Old Harbor Point in that part of Boston harbor known as Dorchester Bay, a tunnel under Dorchester Bay to Squantum Neck, an outfall sewer running in an embankment from Squantum to Moon Island, four storage reservoirs at Moon Island and a discharge sewer to tidewater. Two automatic pumping stations, known as the Union Park Street station and the Summer Street Station, serve the common sewer tributary to the interceptors. In addition, two small pumping stations are operated at highway underpasses at Huntington Avenue and at Charles Street.

Engineering and material inspection services are furnished other divisions of the public works department and other departments of the city government.

The most important statute pertaining to sewage disposal in the City of Boston is Chapter 426 of the Acts of 1897 as amended by the following:

Chapter	257	Acts of	1898
"	450	"	" 1899
"	478	"	" 1900
"	371	"	" 1912
"	268	"	" 1903
"	204	"	" 1908
"	178	"	" 1930
"	304	"	" 1930
"	224	"	" 1932
"	224	"	" 1936
"	511	"	" 1945

This legislation pertains to the issuance of bonds for sewerage works construction, the designations of work contemplated under this act, the method of ordering sewer construction and the method of assessing for betterments.

3. Organization and Staff

a. General: The appropriations for the year 1948 provide for 243 positions in the sewer division of the public works department. The number of employes on the payroll of the division as of October 1, 1948 and the annual rate of expenditures for payrolls are summarized by organization unit within the division as follows:

	Number of Employes	Annual Cost
Central office	12	$ 39,370
Surveys, contracts, plans	38	121,966
Construction and engineering	12	34,870
Maintenance, yard service	89	227,252
Maintenance, main drainage	19	48,564
Maintenance, house connections, permits - records	12	38,500
Reproduction and blueprinting	2	5,900
Material testing	56	160,060
Totals	244	$686,948

Below is summarized by civil service rating the personnel assigned to the sewer division as of October 1, 1948:

Position	Number of Positions
Civil engineer, Grade VI	1
Civil engineer, Grade V	6
Civil engineer, Grade IV	9
Civil engineer, Grade III	15
Transitman (Civil engr. Grade II)	11
Rodman (Civil engr. Grade I)	2
Chief inspector, construction	1
Chief inspector, maintenance	1
Inspector	17
General foreman	1
Foreman	8
Working foreman	1
Gateman	5
Mason	5
Machinist	4
Carpenter	3
Cement finisher	2
Repairer	1
Sewer cleaner	21
Chauffeur	1
Chauffeur-mechanic	1
Chauffeur-laborer	23
Catch basin cleaning machine operator	7
Blueprinter	3
Yardman	4
Laborer	51
Chief clerk	1
Clerk	11
Chief steam engineer	1
Steam engineer	5
Fireman	9
Assistant fireman	1
Oiler	4
Electrician	2
Filth hoist man	6
Total	244

According to the payroll for September 22-28, 1948, 13 of these employes were in temporary status.

b. Plan of Organization: The sewer division is headed by a division engineer who is assisted by a senior civil engineer on special assignment for such duties as the preparation of reports, the conducting of hydraulic studies and calculations, the study of rainfall and sewage flow, and the review of design and plans for a proposed sewage treatment plant. Clerical and stenographic work of the division is supervised by a chief clerk who reports to the division engineer.

The construction of new sewers, surface drains, and catch basins and the rebuilding and repair of sewerage structures is under the supervision of three district engineers, each in charge of one of the following areas:

(1) City proper, East Boston, Charlestown, South Boston, and Roxbury

(2) Dorchester and Hyde Park

(3) West Roxbury and Brighton

Inspection for compliance with contract specifications during construction is the responsibility of an inspection group under the general supervision of the chief inspector of construction.

The engineer of maintenance issues permits for connections, plots records on the sectional drawings of all sewers, surface drains, house connections, and of all branches placed in sewers and surface drains during construction. Tracings of construction record plans are filed in his office and plans for land takings and for sewer assessments are also prepared and filed by this unit. Inspection supervision is, moreover, exercised over the laying, rebuilding, and repairing of house connections. Complaints covering stopped drains and flooded cellars are investigated by this unit.

The engineer of design has the responsibility of designing major structures, and exercises engineering supervision over the Calf Pasture installation, Union Park Street, and Summer Street pumping stations, and the storage and disposal facilities at Moon Island.

Two small organization units, furnishing services to other divisions of the public works department, report directly to the division engineer. These are the reproduction and blueprinting unit and the materials testing laboratory.

The general maintenance of common sewers, surface drains, and catch basins is under the direction of the engineer of yard maintenance to whom yard foremen report. The City is divided into 11 districts for this work and crews work out of five separate yards.

Maintenance of the interceptors, tide gates, regulators, and other adjuncts of the Boston main drainage system is handled by two repair crews and one cleaning crew under the engineer of main drainage.

The existing plan of organization results in 12 employes, all in a supervisory capacity, reporting to the division engineer. This number is considered excessive as the division engineer should be relieved of the details involved in this direct supervision so as to permit him to concentrate his efforts on matters of policy. The present organization pattern is approximately as follows:

Title of Position	Number of Positions
Division engineer	1
Office engineer	1
Chief clerk	10
District engineer #1	14
District engineer #2	13
District engineer #3	11
Chief inspector, construction	12
Engineer in charge of yard maintenance	89
Engineer in charge of main drainage	19
Engineer of maintenance	12
Engineer of design	56
Head blueprinter	2
Inspector (testing laboratory)	4
Total	244

c. Recommended Changes in General Organization Structure: It is suggested that a consolidation of the division organization at the management level be put into effect that would reduce to five the employes reporting direct to the division engineer. A recommended plan of organization is submitted as follows:

Division engineer

- Office engineer (Supr. of clerical work and special studies)
  - Chief clerk (Clerical work and general office records)
- Assistant division engineer (In charge of engineering)
  - Design engineer
  - Maintenance engineer
  - Construction engineer
    - Chief inspector of construction
  - Head of testing laboratory
- Chief house drain inspector
- Superintendent of sewer maintenance
  - District foremen (5 districts)
- Chief operating engineer (In charge of pumping stations)

The proposed organization structure would reduce the number of employes reporting direct to the division engineer from 12 or more to 5, each responsible for a major segment of the divisions activities. Record keeping and miscellaneous office work would be under the general supervision of the office engineer who would also be in charge of any special cost studies, or other special work not of technical engineering character. It would be the duty of this employe to analyze all operations of the division and to advise the division engineer of ways of improving present practices including matters of administrative importance.

All engineering of a professional character in the division would be consolidated in one section headed by an employe who could be titled assistant division engineer. The position would be the second most important in the division and the employe should act as division engineer in the absence of the division engineer. The engineering section would normally be organized on a speciality basis with one engineer in charge of all design, another in charge of construction, and one responsible for the general policies and procedures used in maintenance work but not in charge of the work. The duty of the maintenance engineer would be that of advising as to improvements and needs of the sewer system and as to methods used in maintaining the system.

The construction engineer would be responsible for the layout and inspection of all construction work. He would have a number of construction inspectors working for him for assignment to various construction projects.

The engineering work that is now done in the house drain unit should be transferred to the proposed engineering section and the house drain inspection unit should be limited in duties to inspection in connection with house drains as described elsewhere in this report.

Sewer maintenance would be organized on a district basis with district forces working somewhat independently of the engineering section except for the advice of the maintenance engineer. The superintendent of sewer maintenance should be an employe with considerable administrative ability and knowledge in the methods of cleaning sewers and catch basins. All sewer maintenance work of the division would become the responsibility of the district foremen. The work now performed by the main drainage district on interceptors and flood gates would become the responsibility of the district foreman in whose district the work is located.

The pumping stations and sewage disposal facilities should be the responsibility of the chief operating engineer who would devote most of his time to the operation of the Calf Pasture pumping station but would also be responsible for the operation of the other facilities.

d. Engineering Division: Some overstaffing appears evident in the engineering force as presently constituted. It is

noted that the existing organization of the division includes 44 employes with engineering ratings and that the annual salaries of these employes total over $150,000. Based on the engineering work completed by the division in each of the past three years or since the end of the war, this cost is excessive.

The sewer division has a program for future construction which includes a treatment plant at the location of the Calf Pasture pumping station, modifications of the disposal facilities at Moon Island, and sewer projects classified according to the order of importance. Plans for the treatment plant and for the alteration of the Moon Island facilities are largely completed. Most of this work was done by private consultants.

The plans for sewer construction work estimated to cost approximately $10,000,000, are less than 20 percent completed. The original estimate of cost of the treatment plant was $3,180,000 but it is believed now that the plant, as designed, will cost more than $5,000,000.

If the finances are provided for the construction of all of this program over the next ten year period, the present engineering staffing should be adequate. If less than this amount of work is contemplated the staff should be reduced accordingly. In making these estimates it is assumed that a certain amount of engineering is needed for the general administration of the department and not chargeable to construction work.

e. Construction Inspection Staff: Unless construction work of volume estimated for the 10 year program is undertaken, the number of inspectors (11) now on the division payroll under the chief inspector of construction is excessive. These inspectors are assigned from a pool to the district engineers to insure compliance with contract specifications. The inspectors are concerned only with contractor performance. They do not inspect materials nor work performed by city forces. During the winter months, when construction work is not heavy, it is reported by the chief inspector of construction that inspectors are assigned to the inspection of lateral sewers and catch basins to determine work that needs to be done to maintain these integral parts of the system.

f. Maintenance Inspection Staff: The present maintenance inspection unit consisting of a chief inspector, six inspectors, and one investigator appears to be overmanned. These inspectors follow up complaints covering backed up sewers or water in the basements of private and public buildings. They also inspect the construction of house drains connections. Their investigations are primarily to protect the interests of the City in the event of a damage suit. The inspectors file a written report on their investigations; these reports are filed for future use as court evidence, if needed.

Records of the division indicate that 2898 sewer complaints were received in 1947. Each of these was investigated and an inspector's report filed thereon. The procedure appears to have protected the City's interests as the number of awards for damages claimed to have resulted from backed up sewers has been negligible over the past several years. The investigation of complaints and the recognition that the inspector will file a detailed report may discourage the filing of damage suits that might otherwise materialize as the result of flooding from obstructions in sewer lines.

The City has standardized on bituminous joints for both house connections and main sewers.

In view of the number of inspections made in recent years, and in view of the fact that inspectors are used in the office of the division to take care of visitors at the counter, it is believed that four inspectors could do the work satisfactorily as compared with the present number of six if three motor vehicles were assigned for their use in making inspections and investigations.

g. Office Clerical Staff: The clerical group - under the control of a chief clerk - keeps the budgetary and general accounts of the division. The staff as of October 15, 1948, was as follows:

	Pay Rate Weekly	Pay Rate Yearly	Yearly Cost
Chief Clerk	$70.77	$3700	$ 3700
Clerk - payrolls	66.94	3500	3500
" - ledger accounts	61.20	3200	3200
" - contractors accounts	53.55	2800	2800
" - budget control vouchers	51.64	2700	2700
" - payroll - purchasing	51.64	2700	2700
" - sewer loans - material costs	49.73	2600	2600
Clerk-Stenographer	51.64	2700	2700
" "	47.81	2500	2500
Total of 9 persons			$26,400

The accounts of the division are kept in painstaking fashion and in considerable detail, costs being divided into three main headings of improved sewers, outside improved sewers, and sewerage works. Improved sewers covers work at the pumping stations and at Moon Island and on the main and intercepting sewers. Outside improved sewers is maintenance work on other sewers than main and interceptors. Sewerage works is new construction work charged to special appropriation or to sewerage loan accounts.

Division payrolls are made up in the office from daily and weekly reports received from the foremen in charge of each

yard. The daily report, telephoned to the City Hall each morning details the work of crews during the preceding day. The information is assembled and typed on one sheet which is submitted to the division engineer and other interested parties. The weekly report breaks down labor time by the day or half day and from it, the payroll costs are distributed to appropriate accounts. The weekly yard reports also detail materials and supplies used from stock and the cost of these is distributed to appropriate accounts.

A record is kept of the encumbrances against the various budgetary accounts and in order to estimate accurately the probable cost of requisitioned supplies, a visible card index system is maintained where each class of item generally purchased has a record showing vendor, date and number purchased, cost and the date on which payment was made by the treasurer's office. The system is elaborate and complete, but not needed since the division does not do its own purchasing. Such a record would normally be maintained by the purchasing agent. It is only for emergency purchases that the division suggests a suitable vendor and such emergencies are said to be rare.

It is recommended that this index be modified to eliminate such historical data as vendors' names and dates of invoice payments and that the index be utilized for exercising effective centralized inventory control as well as for the accumulation and use of appropriate material cost figures. It is also recommended that the division depend on the auditor's accounts for information as to the encumbrances against its budgetary accounts and abandon the keeping of accurate encumbrance records themselves.

The accounts of the division are kept in two separate systems. The first corresponds to the budgetary items for which appropriations are made and the monthly balances are checked with the auditor's accounts. The second and more complicated system divides expenditures among maintenance work on improved sewers, outside improved sewers, and sewerage works. Each of these is further subdivided into various items making up overhead charges and into geographical divisions for repairs to catch basins and sewers, and for new catch basin construction. The annual report of the public works department gives details of expenditures under these headings splitting each up into amounts paid for such items as labor, trucks, and contractors.

It is recommended that a study be made to determine whether this elaborate accounting system cannot be simplified so that the basic accounts under budgetary items can be made the only complete accounts. These could be subdivided where necessary to furnish cost figures for separate operations. The impression given is that the present system is more elaborate than is necessary and that the figures it produces are of little practical value.

h. Material Testing Laboratory Staff: The laboratory, while a unit in the sewer division, performs work for other

divisions. The inspector in charge estimates that 75% of the work of the laboratory is performed for the benefit of the highway division. Supplies for the laboratory are normally ordered through the sewer division, although a recently ordered hydraulic compression testing machine is to be paid for from the funds of the highway division. A laboratory assistant has recently been engaged to extend the scope of this unit's services.

The staff of the laboratory as of November 1, 1948 was, as follows:

	Number of Positions	Pay Rate Weekly	Pay Rate Yearly	Annual Payroll Cost
Inspector	1	$55.46	$2900	$ 2900
Lab. asst.	1	53.55	2800	2800
Chauf.-lab'r-cement finisher	1	50.50	2626	2626
Laborer-cement finisher	1	50.50	2626	2626
Laborer	1	44.50	2314	2314
Totals	5			$13,266

The laboratory's facilities for conducting certain tests are limited and much of the testing is performed by the laboratory of the state department of public works. State facilities and personnel are used for testing concrete samples, harbor water for pollution and B.O.D. content, sewage for saline content, and gravel and sand for abrasive qualities.

Records of the laboratory indicate that 331 concrete tests were made in 1947, and the inspector-in-charge estimates that pollution tests were made regularly twice a month and pit tests for sand and gravel covering the sources of supply for each contractor were made twice a month. Approximately 125 pipe tests were made.

It is recommended that the testing laboratory be placed under the supervision of the proposed engineering section.

i. Blueprinting and Reproducing Unit Staff: This unit appears to be properly staffed but it is recommended that it be transferred to the department's central office as services are performed for all divisions of the department.

j. District General Maintenance Staff: Yard crews working out of five yards maintain the common sewers, surface drains, and the majority of the catch basins. The City has been divided into 11 districts for this work. The five yards and the districts each serves are as follows:

Albany Street Yard: The Albany Street yard serves districts 1, 7, 8, 9, and 10. It was staffed by 35 employes according to the payroll for September 22-28, 1948. The annual payroll cost for these employes at the rates in effect at the time of this payroll was $88,022. The staffing pattern was as follows:

	Number of Employes	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Foreman	1	$63.11	$3300	$ 3,300
Working foreman	1	55.46	2900	2,900
Mason	2	53.50	2782	5,564
Catch basin machine operator	3	50.50	2626	7,878
Sewer cleaner	7	50.50	2626	18,382
Chauffeur-laborer	9	47.50	2470	22,230
Laborer	12	44.50	2314	27,768
Totals	35			$88,022

This yard is manned six week days during the regular day shift. No force is on duty Sundays or holidays. Until recently a night crew was on duty except on week-ends and holidays to answer complaints of catch basin flooding or sewer stoppage.

Two catch basin cleaning crews operate out of this yard covering the districts for which this yard is responsible. It is understood that crews from this yard also clean catch basins in the districts located in East Boston and Charlestown.

Records indicate that remedial measures were taken in 1948 (through September) on the following numbers of complaints covering overflowing or stoppage:

Month	Number of Catch Basin Complaints	Number of Sewer Complaints
January	52	78
February	48	96
March	97	138
April	70	141
May	76	114
June	75	123
July	69	131
August	76	95
September	49	66
Totals	612	982

It would appear that this yard is overmanned with employes holding the rating of chauffeur-laborer or of laborer. One explanation for this condition is the assignment of one more employe than appears necessary to catch basin cleaning crews. This problem is discussed elsewhere.

Child Street Yard: The employes assigned to the Child Street yard, which covers districts 5 and 5A, according to the payroll for September 22-28, 1948, held the following ratings:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Foreman	1	$63.11	$3300	$ 3,300
Clerk	1	51.64	2700	2,700
Mason	1	53.50	2782	2,782
Catch basin machine operator	2	50.50	2626	5,252
Sewer cleaner	1	50.50	2626	2,626
Chauffeur-laborer	1	47.50	2470	2,470
Laborer	8	44.50	2314	18,512
Yardman	1	49.73	2600	2,600
Totals	16			$40,242

It is considered that the number of employes, assigned to this yard, holding the rating of laborer is excessive. This opinion appears to be confirmed by the fact that two laborers had been assigned clerical duties at the time the yard was visited.

Gibson Street Yard: The Gibson Street yard is responsible for district 6. Its staffing pattern, according to the payroll for September 22-28, 1948, was as follows:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Foreman	1	$63.11	$3300	$ 3,300
Yardman	1	44.95	2350	2,350
Mason	3	53.50	2782	8,346
Carpenter	1	50.50	2626	2,626
Catch basin machine operator	1	50.50	2626	2,626
Sewer cleaner	5	50.50	2626	13,130
Chauffeur-laborer	2	47.50	2470	4,940
Laborer	7	44.50	2314	16,198
Totals	21			$53,516

Although the staff of this yard does not include an employe with a rating of clerk, it was found upon visiting the yard office that three employes were performing clerical duties.

It was reported that the carpenter assigned to this yard is sent to make repairs and construct tool boxes or other equipment for the district yards or for the pumping stations.

An air-compressor mounted on a 1 1/2 ton truck has been assigned to this yard but is available for city-wide use. The operator assigned to the compressor works outside the district when the compressor is assigned elsewhere.

There appears to be an excessive number of employes rated as sewer cleaners assigned to this yard. Certain of these employes are engaged in regularly assigned duties not consistent with their ratings.

Western Avenue Yard: The Western Avenue yard covers district 4. Its staffing pattern according to the payroll for September 22-28, 1948, was as follows:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Foreman	1	$63.11	$3300	$ 3,300
Yardman	1	47.81	2500	2,500
Sewer cleaner	1	50.50	2626	2,626
Chauffeur-laborer	1	47.50	2470	2,470
Laborer	4	44.50	2314	9,256
Totals	8			$20,152

This yard has two crews of three men each, one normally cleaning catch basins on a complaint basis and one answering sewer complaints. It is understood that repairs to catch basins in this district must be made by a mason borrowed from one of the other yards.

East Eagle Street Yard: The East Eagle Street yard covers districts 2 and 3. Its staffing pattern according to the payroll for September 22-28, 1948 was as follows:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Foreman	1	$63.11	$3300	$ 3,300
Sewer cleaner	2	50.50	2626	5,252
Chauffeur-laborer	1	47.50	2470	2,470
Laborer	2	44.50	2314	4,628
Totals	6			$15,650

As this yard has limited equipment, much of the catch basin cleaning or freeing of sewers by rodding is handled by personnel and equipment assigned from the Albany Street yard.

The yards of the sewer division appear to be located to properly serve the five districts that are contemplated. It is suggested that these districts coincide roughly with those under the responsibility of district engineers in the present organization pattern except that East Boston and Charlestown be made one district and West Roxbury and Brighton be served by separate district organizations.

A better distribution of work load among the yards should result in less idle time by the catch basin and sewer cleaning crews. It would appear that the staffing pattern for each district office should be about as follows:

Classification	Number of Employes
Foreman	1
Clerk	1
Yardman	1
Mason	1
Chauffeur-laborer	2
Catch basin machine operator	2
Sewer cleaner	2
Laborer	2
Total	12

The Albany Street yard should also include employes who would be available for work in the various districts. It would appear that a carpenter, a mason, a machinist, and two or three laborers should be assigned to this group.

Records of the division indicate that it is unnecessary to man any of the district yards on nights, Sundays, or holidays for emergency calls. If conditions change and extra shifts are necessary at any of the yards, additional positions would be required.

Each crew reports to its respective yard in the morning. Such material and equipment as is needed is loaded on the truck and the crew departs for its first job. Assignments are customarily made to cover approximately one-half day's work. Some of the crews report back and some call back for further assignment during the day. This practice results in considerable lost time. It is recommended that each crew be assigned more work than could possibly be finished during the day, and that the foreman be required to call the yard office at the completion of each job to receive any emergency assignments.

Practically all work performed by sewer maintenance and cleaning crews is on a complaint basis. Only a few of the complaints involve common sewers. Most of the complaints cover stopped house connections and plugged catch basins. In general, the yard forces have been able to keep up with these complaints.

There is considerable work to be done that is not of an emergency nature. Estimates of time required for each assignment and a more careful scheduling of work should make it possible to reduce the number of employes engaged in maintenance without lowering the present standard of service.

A net saving of twenty employes is believed possible in the district maintenance organization by a better distribution of work load responsibility among the various yards.

k. Main Drainage Maintenance Staff: Responsibility for the maintenance of the interceptor sewers, tide gates, regulators, and sumps and for cleaning interceptors and main sewers to the point of delivery to one of the metropolitan systems or to the Calf Pasture pumping station has been assigned to the engineer of main drainage. The staffing pattern of this unit with headquarters at the Child Street yard, according to the payroll of September 22-28, 1948, was as follows:

Position	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Engineer of main drainage (a)	1	$65.39	$3400	$ 3,400
Foreman	1	63.11	3300	3,300
Yardman	1	49.73	2600	2,600
Laborer	2	44.50	2314	4,628
Maintenance Crew				
Machinist	1	53.50	2782	2,782
Carpenter	1	50.50	2626	2,626
Laborer	3	44.50	2314	6,942
Maintenance Crew				
Sewer cleaner	2	50.50	2626	5,252
Chauffeur-laborer	1	47.50	2470	2,470
Laborer	1	44.50	2314	2,314
Cleaning Crew				
Foreman	1	63.11	3300	3,300
Catch basin machine op.	1	50.50	2626	2,626
Sewer cleaner	2	50.50	2626	5,252
Chauffeur-laborer	1	47.50	2470	2,470
Laborer	1	44.50	2314	2,314
Totals	20			$52,276

(a) Junior civil engineer covered on the payroll of one of the districts.

The maintenance crews repair and replace tide gates, relieve stoppages in sumps, and adjust and repair regulators. The cleaning crew, using power winch equipment, remove silt and other deposits from the interceptors and main sewers. It was reported that crews and equipment of the main drainage maintenance group frequently are diverted to work in the districts where sewer cleaning is on a complaint basis and at times stoppages cause flooding that requires that the various yard crews be assisted in correcting the condition to prevent damage to private property.

In view of the maintenance problems of the Boston main drainage system as will be discussed elsewhere in this report, it would appear that the staffing of this organization unit is satisfactory and the unit is not overmanned.

The recommended organization plan for the sewer division, however, provides that all maintenance of sewers be handled by the district yards. If the interceptors and main sewers of the Boston main drainage district are retained in their present status under the jurisdiction of the division, additional personnel should be assigned to the various districts. The number of additional employes should not exceed the number now making up the two maintenance crews and the one cleaning crew. The employes assigned to these crews could be transferred to the district yards in whose areas the interceptors are located.

1. Pumping Station and Disposal Works Staff: The engineer of design is considered to be responsible for the operation of the pumping stations and the disposal works. The supervision of these activities appears to be divided between this employe and the division engineer. The Calf Pasture and Union Park Street pumping stations and the Moon Island storage basins are operated on a 24-hour basis.

Calf Pasture Pumping Station: The staffing pattern of this unit according to the payroll for September 22-28, 1948 was as follows:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Chief steam engineer	1	$66.94	$3500	$ 3,500
Executive clerk	1	63.11	3300	3,300
Steam engineer	5	61.42	3194	15,970
Electrician	2	61.20	3182	6,364
Fireman	9	54.92	2856	25,740
Asst. fireman	1	47.50	2470	2,470
Oiler	4	54.92	2856	11,424
Gateman	1	54.92	2856	2,856
Filth hoist man	6	54.92	2856	17,136
Machinist	2	53.50	2782	5,564
Asst. machinist	1	50.50	2626	2,626
Carpenter	1	50.50	2626	2,626
Laborer	1	44.50	2314	2,314
Totals	35			$101,890

The staff of the Calf Pasture pumping station appears to be larger than required but part of the explanation for this apparent overstaffing may be the fact that the station includes a considerable amount of old and obsolete equipment. As it is planned to replace this pumping station with a modern structure, the department has understandably been reluctant to replace much of the old machinery although the orginial steam-driven plunger pump has been replaced with four - 30" horizontal centrifugal pumps rated at 32 MGD each and two - 36" vertical centrifugal pumps with a rated capacity of 41 MGD each, all electrically driven.

The division engineer and the commissioner both recognize that the staff is larger than might normally be expected for the size of the pumping station. It is, therefore, assumed that the overstaffing is regarded as a temporary condition that will be corrected when present facilities are replaced with the proposed treatment plant.

It is the opinion of the authors of this report that some reduction in the staff of the Calf Pasture pumping station is possible in the operation of present facilities. The elimination of four positions carrying the rating of oiler and one filth hoist man is recommended. At the present time a portion of the original steam generating facilities is being used to generate electricity for the station's electric lights, machine shop, and gates. The facilities are not of sufficient capacity to supply current to the electric pumps.

Consideration should be given to the abandonment of additional steam generating capacity to the extent that would permit the elimination of one fireman per shift.

Union Park Street Pumping Station: The staff assigned to this station is as follows:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Catch basin machine operator	1	$50.50	$2626	$2626
Laborer	3	44.50	2314	6942
Totals	4			$9568

The staff of this station acts largely in a watchman capacity. The station operates only during periods of storm water run-off. Pumps are all motor driven by electricity; they consist of four vertical centrifugal pumps, three - 36" rated at 44 MGD each and one - 26" rated at 22 MGD. The size of the staff appears correct but the employes are misclassified.

Moon Island Storage Basins: The staffing pattern of the Moon Island facilities, according to the September 22-28 payroll, was as follows:

	Number of Positions	Rate of Pay Weekly	Rate of Pay Yearly	Annual Payroll Cost
Foreman	1	$63.11	$3300	$ 3300
Gateman	4	54.92	2856	11424
Chauffeur-laborer	3	47.50	2470	7410
Laborer	3	44.50	2314	6942
Totals	11			$29,076

The staff does not appear excessive in view of the fact that the facilities are manned 24 hours daily. It is necessary to transport personnel from Boston to the Moon Island plant which is located in the City of Quincy. Therefore, each shift includes a chauffeur-laborer. Constant staffing at Moon Island is necessary as the gates are opened and sewage discharged through the out-fall sewer into Boston harbor for two hours, beginning one hour after high tide. The gates are then closed and storage resumed.

4. Plant and Equipment

a. Pumping Stations and Disposal Works: The Calf Pasture pumping station and the Moon Island disposal works were constructed at the time the interceptors were built to carry sewage of the Boston main drainage district to one location for discharge into the harbor. These facilities are now nearly 75 years old and the pumping station in particular is considered obsolete. The deposit sewer that is used in conjunction with the pumping station is also considered to be of an outmoded design. The replacement of the Calf Pasture pumping station and the modernization of the Moon Island facilities is under consideration by the public works department. The Calf Pasture station is served by two independent power lines of the Boston Edison Company.

The Union Park Street pumping station was constructed in 1915. It is considered to be adequate for its function which is to dispose of storm water in the low area of the South End. It has been satisfactorily maintained.

The Summer Street pumping station, which is intermittent and automatic in operation, is also considered as satisfactory for the function for which it was designed. It contains two - 8" vertical centrifugal pumps, motor-driven and rated at 3000 GPM each.

The smaller automatic pumping stations at the Huntington Avenue and Charles Street underpasses are of recent design and construction.

b. Dorchester Bay Tunnel: The condition of the tunnel itself is not known as inspection is not possible unless sewage is discharged at the Calf Pasture before entering the so-called West

Shaft. The state authorities are reluctant to grant the City permission to do this. The West Shaft which carries sewage from the deposit sewer at the Calf Pasture to the tunnel is recognized as needing strengthening but the East Shaft and the outfall sewer that carry sewage to the storage basins at Moon Island are regarded as in satisfactory condition.

c. Main and Interceptor Sewers: Although in need of cleaning, the trunk lines are in surprisingly good condition considering their age. The brick tunnels, manholes, various chambers, and underground working areas reflect the excellent workmanship that was typical of immigrant and first generation bricklayers who settled in Boston near the close of the last century. There are, however, wooden interceptors the exact condition of which is not known, although it is recognized by the division that their early replacement is essential. Many of these sewers as well as others constructed of wood and brick, brick and slate, or a single ring of brick are in poor structural condition and their replacement, together with old sanitary or combined sewers that are inadequate in size, has top priority in the division's contemplated construction program.

d. Overflows: Many wooden overflows are recognized as structurally poor and in some instances they are considered to be in danger of collapsing. Their replacement is second in priority only to the rebuilding of structurally poor or inadequate sanitary or combined sewers in the division's contemplated construction program.

e. Surface Drains: While generally satisfactory in condition, the system is deficient in the number of surface drains that it should include to carry drainage to tidewater. Conduits should be constructed to cover certain open brooks that are now draining parts of the system.

f. Tide Gates: The maintenance problems that tide gates present will be discussed in another section of this report. A substantial amount of money would have to be spent in changing the design of many of the gates to keep salt water out of the system. In general, the working condition of the gates in operation is good as the department keeps two crews on a maintenance program which includes frequent adjustment, oiling, cleaning and rebuilding of these vital appurtenances in the system.

g. Regulators: Although many of the regulators originally installed in the system have been removed, those that remain in operation are being maintained satisfactorily as a result of a program calling for their frequent adjustment and cleaning. Their condition is generally regarded as satisfactory for the function they were designed to perform.

h. Tributory Sanitary Sewers and Surface Drains: It is not possible to characterize the condition of this part of the

Boston main drainage system. Some sewers should be replaced as they are of inadequate capacity; there are still some sections of the City where buildings are served by cesspools or septic tanks and the division's plans include extension of the system to construct both sanitary sewers and surface drains in these areas. A program of separation is still in progress where the tributory sewers are a combined system.

i. Catch Basins: Many of the catch basins have broken traps as the result of machine cleaning. The basins are large and, therefore, adaptable to machine cleaning. The yard crews follow a rather well defined program of repairing damaged basins, although they have been unable, according to the various foremen, to keep up with the volume of broken traps requiring replacement.

j. Yard Facilities: Yard facilities are, in general, regarded as satisfactory. A small office for the foreman and for handling clerical work, a room for employes to change clothing, toilet facilities and moderate storage space is sufficient for the district yards. The Albany Street yard requires greater storage space than do the other yards as it is used for such central storage as the division requires.

Some improvement in these facilities might be considered for the comfort and convenience of employes. It was noted that in general the toilet and washing facilities at the yards were poor and in unsatisfactory working condition.

k. Automotive Equipment: The motor equipment used by the sewer division was assigned as indicated below according to records of the division on June 22, 1948. This equipment has been maintained in excellent condition as is the policy of the public works department and as described in the report of the garage facilities of the department.

Assignment	Dept. No.	Type	Year	Mfr.
Division engineer	Se 130	Sedan-4 dr.	1947	Buick
Chief inspector, construction	Se 120	" " "	1946	Ford
General foreman	Se 119	" " "	1946	"
District engineer	Se 145	" " "	1947	"
District engineer	Se 146	" " "	1947	"
District engineer	Se 143	Sta. Wagon	1947	Willys
Foreman - Moon Island (trans. of personnel from Dorchester yard to Moon Island)	Se 144	" "	1947	"
Calf Pasture Pumping Station. (trans. of personnel to and from station to Dorchester.)	Se 142	" "	1947	"
Calf Pasture Pumping Station. (general maintenance)	Se 128	½T. Pickup	1947	Ford
Testing laboratory. (trans. concrete samples)	Se 121	" "	1946	"

Assignment	Dept. No.	Type	Year	Mfr.
Assigned to garage	Se 117	½T. Pickup	1946	GMC
District foreman	Se 138	" "	1947	Ford
District foreman	Se 116	" "	1946	GMC
District foreman	Se 118	" "	1946	"
District foreman	Se 140	" "	1947	Ford
Western Avenue Yard. (Brighton general maintenance)	Se 139	" "	1947	"
District foreman	Se 131	" "	1947	"
Engineer of main drainage	Se 132	" "	1947	"
Foreman	Se 126	" "	1947	"
Main drainage (maintenance)	Se 141	" "	1947	"
Albany St. Yard (maintenance emergency crew)	Se 123	1½T. Express	1946	"
Albany St. Yard (maintenance emergency crew)	Se 125	" "	1947	"
Gibson St. Yard, (maintenance emergency crew)	Se 127	" "	1947	"
Child St. Yard, (maintenance emergency crew)	Se 129	" "	1947	"
E. Eagle St. Yard, (general maintenance)	Se 135	1½T. Express	1947	Ford
Main drainage, (Maintenance)	Se 122	" "	1946	"
Main drainage, (Maintenance	Se 124	" "	1947	"
Albany St. Yard, (general maintenance)	Se 134	" Dump	1947	"
Gibson St. Yard, (gen'l maint.)	Se 136	" "	1947	"
Main drainage, (sewer cleaning)	Se 137	" "	1947	"
Gibson St. Yard - (Compressor mounted on truck for city-wide service.)	Se 133	1½T. " 105 CFM Compressor	1947	Ing-Rand
Albany St. Yard - (C.B. cleaning)	Se 152	2 T. Dump	1948	Ford
Albany St. Yard - (C.B. cleaning)	Se 155	" " "	1948	"
Child St. Yard - (C.B. cleaning)	Se 153	" " "	1948	"
Gibson St. Yard - (maintenance)	Se 154	" " "	1948	"
Albany St. Yard - (C.B. cleaning machine, mounted)	Se 148	2 Ton	1948	Ford Netco
Albany St. Yard - (C.B. cleaning machine, mounted)	Se 149	" "	1948	"
Child St. Yard - (C.B. cleaning machine, mounted)	Se 150	" "	1948	Ford Hydro-Crane
Western Ave. Yard -(C.B. cleaning machine, mounted)	Se 151	" "	1948	"
Gibson St. Yard - (C.B. cleaning machine, mounted)	Se 147	" "	1947	Ford Netco
Albany St. - (C.B. cleaning)	Se 115	5 Ton	1945	White
Gibson St. Yard-(C.B. cleaning)	Se 113	" "	1945	"
Western Ave. Yard-(C.B. cleaning)	Se 114	" "	1945	"

Assignments of this equipment appear to be satisfactory although it is believed possible for one station wagon to transport personnel to both Moon Island and the Calf Pasture without unreasonable inconvenience to employes.

The number of catch basin cleaning machines is regarded as inadequate for the needs of the division as will be discussed in another section of this report. The purchase of two additional catch basin cleaning machines properly mounted on a suitable type truck chassis is recommended.

A total of three cars or pick-up trucks is recommended for assignment to the maintenance inspection group.

l. Sewer Cleaning Equipment: A recently purchased "scooter" for cleaning sewers has been assigned to the Gibson Street yard and experience with its operation has to date been satisfactory. As the division has been slow to adopt mechanical equipment for sewer cleaning, it is recommended that if this device proves satisfactory after a reasonable trial, additional units be purchased and assigned to each district yard.

The main drainage cleaning crew uses power winch equipment to clean the large trunk lines. This method is regarded as satisfactory in consideration of the size of the interceptors and main sewers.

For the most part, the City depends on hand-operated equipment to clean or free blocked sewers. It appears that some of the district yards have not been provided with sufficient rods for manually operated flexible shaft cleaning devices. It is recommended that the division review the assignment of cleaning devices to the yards and determine that sufficient equipment has been assigned so that each truck and crew may be properly equipped, particularly to take care of emergency conditions during periods of heavy storm run-offs.

m. Materials Testing Laboratory: As discussed elsewhere, the facilities of the laboratory are not adequate to permit personnel to make many tests on materials and harbor water. A new hydraulic testing machine has recently been acquired which will lessen the dependence on state-owned facilities and on private laboratories. It is recommended that a study be made of equipment at the laboratory and that additional facilities be installed if their need can be demonstrated to permit the effective utilization of the time of laboratory personnel.

5. Policies and Procedures

a. Need for an Organization Manual: The sewer division of the public works department should prepare a written manual of organization and procedures. When prepared, this manual should be

distributed to employes in managerial, supervisory, and key positions. Each instruction should be numbered according to a predetermined system to facilitate filing and reference and each should be limited to a single subject to facilitate changes. The instructions should cover in detail such subjects as policies, organization, functions, duties, responsibilities, authorities, and procedures.

It is recommended that an organization manual be developed without delay.

b. Lack of Uniformity in Treatment of Property Owners for Clearing House Drains: It is the policy of the division to respond to a complaint of sewer stoppage with a flushing crew from one of the district yards and to send an inspector who will investigate the complaint and file a report to protect the interests of the City in the event of a subsequent damage suit. The flushing crew determines where the stoppage has occurred,and clears the line if flow in the common sewer has been impeded. If flooding is traced to stoppage or other condition in the drain within the private property line, the sewer division will flush the private sewer and has announced a charge of $15.00 for this service if the efforts of the flushing crew are successful in freeing the drain.

The announced procedure is to require a $15.00 deposit payable in the division office at the City Hall. Upon receipt of this deposit, the foreman of the yard in whose territory the private property is located is notified and authorized to attempt to free the property owner's drain. If efforts of the flushing crew are not successful, the $15.00 deposit is returned; if successful, the division retains the amount for the service performed. Until recently, one-half of the amount was retained if the drain was not freed.

Records of the division indicate that from January 1 to September 20, 1948, 15 private drains have been flushed and refunds had been made in 7 instances. Records of the district yards indicate that flushing crews had worked on several more private drains than these figures indicate. It appears obvious that the City is being paid for only a small percentage of private drains that are freed by the district flushing crews. It was established that flushing crews will attempt to clear a house drain, as a health protection measure, if in the opinion of the foreman, the occupants of a private dwelling do not appear to be able to afford the $15.00 charge.

During the past year or two it appears that the policy has changed toward ignoring the charge and thus the cleaning of private house sewers is considered to be a public service. Such a policy is of major importance and should be established,in writing, by no less authority than the commissioner of public works.

It would seem that the clearing of private house sewers goes beyond the normal responsibilities of a public body. Further, the adoption of such a policy may prove to be costly as there is certain to be a considerable amount of abuse of a service of this kind that is free to the public. Rather than make needed repairs it can be expected that owners would ask for frequent service from the city.

It is recommended that the service be continued but that a flat charge be made equal to at least one half of the cost. Possibly a charge of $7.50 would be fair. Also it is recommended that the service be granted on a curtesy basis with no guarantee of results and that no refunds be made.

c. Procedure in Investigating Complaints: There is considerable doubt as to the justification of sending both an inspector and a flushing crew to investigate a complaint that flooding is resulting from a sewer that has backed up. Under this procedure, the inspector does not make an examination of the main sewer as he does not have tools to open the manholes. It is recommended that inspectors be provided with proper equipment to permit them to examine the public sewer and that flushing crews be dispatched on a work order basis after the inspector has determined that the source of trouble is not inside the property line. As maintenance inspectors travel by public transportation, their ability to investigate complaints is limited by the problem of reaching many locations in the City by this method. Proper inspection requires tools which can best be carried by vehicle. It is recommended that at least three vehicles be assigned to the maintenance inspection unit.

d. Cleaning Catch Basins: The sewer division cleans approximately 3500 basins each year with City forces, principally on a complaint basis. In addition, catch basins are cleaned by a contractor under a contract that averages $20,000 annually. The contractor cleans an area on a unit price basis per cubic yard, the amount being determined from measurements taken to the top of the material from the cover. It is estimated that approximately 2000 catch basins are cleaned each year by contract.

Because the contractor works in a given area and division forces work on a complaint basis, a comparison of performances is not particularly significant. It is to be noted, however, that the contractor uses two men to a cleaning crew, while the City uses three. It has been reported that the contractor cleans from 7 to 11 basins daily removing about 35 yards of material. The City crews average about 8 catch basins daily.

It is believed that three men to a catch basin cleaning crew is unnecessary. It is recommended that each of these crews be reduced to two men.

Further, it is believed that catch basins can be cleaned by City forces at a lower cost than by contract. The purchase of two additional catch basin cleaning machines and the cessation of letting out the cleaning of basins by contract is recommended.

e. Assessing the Cost of Sewer Construction: All new sewerage work is ordered by the Board of Street Commissioners. Funds for sewer construction are provided from the sewerage works loan. Assessments are made by the Board of Street Commissioners. By ordinance, as defined in Chapter 426 of the Acts of 1897, the assessment to property owners is limited to $4.00 a linear foot or $2.00 a foot for frontage on either side of the street. Steps should be taken to have this limitation removed as construction costs at the present price level run between $8.00 and $12.00 a foot and the City is paying most of the cost of a new sewer that will primarily benefit the abutting property. Upon application, it is within the discretion of the Board of Street Commissioners to abate this assessment if immediate connection to the sewer is not contemplated by the property owner. In the event abatement has been made, the amount due must be paid when it is desired to connect to the sewer before the division will issue a drain laying permit.

f. Assessing the Cost of Sewer Connections: Connections to the common sewers may be made only by licensed drain layers. A street opening permit must be obtained from the highway division of the public works department before a drain laying permit can be secured. Drain layers can obtain the location of taps on private property as well as on public property from the house connection unit.

At one time, it was the policy of the City to construct extensions of wyes to the curb line so that the pavement would not have to be broken at the time the sewer connection was made. As frequently these wyes were not located properly for a new building, the policy was discontinued and under new construction procedure, wyes are now plugged at the sewer line. Therefore, the pavement must be broken to permit connections to be made. An entrance fee is charged and collected by the house connection unit as properties are connected with the sewer. The cost of repaving cuts made to permit connections is assessed by the permit office of the highway division, the charge depending upon the type of pavement that has been opened.

g. Construction and Rebuilding of Sewers, Surface Drains, and Catch Basins: It is the policy of the public works department to accomplish practically all construction and rebuilding of sewerage structures by contract. The work is performed under advertised contracts.

The labor force of the yards, however, occasionally perform minor construction work and rebuild and repair broken sewers, manholes, and catch basins. Engineering supervision of work done by City forces is provided by the district engineering organizations.

6. Maintenance Problems of the Boston Main Drainage System

a. Description of the System: The Boston main drainage system was designed to intercept the sewage discharging into the harbor through many outlets. The main intercepting sewer begins at Huntington Avenue and Gainsboro Street receiving at this point the discharge from the west side interceptor. The main interceptor reaches its maximum diameter of 10½ feet at the approach to the Calf Pasture pumping station. At Camden and Tremont Streets the main interceptor receives the sewage from the Stony Brook interceptor; its course to this point from Huntington Avenue is via Gainsboro Street, under the tracks of the New York, New Haven, and Hartford Railroad, and along Camden Street. From Tremont Street the course continues along Camden Street, across Washington Street to Massachusetts Avenue, along Massachusetts Avenue to Clapp Street, South Boston, where it crosses private land to Mount Vernon Street. At Massachusetts Avenue near Albany Street, discharge of the east side interceptor is received. After passing under Dorchester Avenue, the main interceptor joins the South Boston interceptor at Mount Vernon and Von Hillen Street. Shortly beyond this point the Dorchester interceptor joins the main sewer which continues along Mount Vernon Street to the Calf Pasture pumping station.

The branch interceptors receive the sewage from lateral lines in roughly the following areas:

West Side Interceptor: Southerly side of Charles River Basin from Charter Street in the North End to Hereford Street at Beacon Street, via Hereford, Dalton, and Falmouth to the main interceptor at Gainsboro and Huntington Avenue.

East Side Interceptor: From Hanover Street, along Atlantic Avenue, across private land to Massachusetts Avenue near Albany Street, extending along the easterly water front of Boston proper.

Stony Brook Interceptor: From Elmwood and Linden Park Streets along Stony Brook Valley via Hampshire, Ruggles and Cabot Streets to Tremont, along Tremont to a junction with main sewer at Camden.

South Boston Interceptor: Two branches joining at Hyde Street one branch from corner of L and East First Streets, via West First and Dorchester Avenue serving the northerly part of South Boston. Second branch starts near Farragut Road and East First Street extending along southerly and easterly boarders of South Boston through East Ninth Street and Columbia Road to Hyde Street.

Dorchester Interceptor: Begins at Granite Avenue at the Neponset River receiving sewage from the lower part of the old Neponset River Valley sewer now controlled by the south metropolitan sewerage district. Course follows Granite Avenue to Park Street, Fields Corner, generally parallel to the shore line of Dorchester Bay to Mount Vernon Street.

The sewerage tributary to the system is partially a separate system and partially a combined system with separation still in progress. In separate system areas the storm water drains discharge into the nearest water course or directly into the harbor. Legislation pertaining to the separation of sewerage and storm water may be found in Chapter 383 of the acts of 1903 as amended by Chapter 464 of the acts of 1907, Chapter 348 of the acts of 1912 and Chapter 74 of the Special Acts of 1918.

In low areas subject to flooding, the combined sewers are connected directly to the interceptors. In areas where drainage from flooding is less important, float regulators have been installed. These close when the water level in the interceptor reaches a predetermined height. There are also district regulators that operate in the same manner to relieve the main interceptor under storm conditions. However, many of these regulators have been removed and in others the cut off level has been raised to compensate for the increased flow. Consequently, storm water enters the main drainage system as the result of modifications in the original system; these adjustments have been necessary to avoid almost continuous overflowing.

The Union Park pumping station was constructed in 1915 to dispose of storm water from that part of the Boston main drainage system included in the South End. The combined storm water and sewage pumped at this station are discharged into South Bay.

A system of storm water conduits operates within the area served by the Boston main drainage district. In addition, the area is served by the Boston marginal conduit which extends along the embankment of the Charles River Basin and which is operated by the Metropolitan District Commission. Many of the sewers in the areas served by these conduits are on the combined plan, and there are several overflows from these sewers to the conduits.

The overflows that drain into the harbor and its estuaries from the intercepting sewers and from storm drains are of the exterior type having an outlet in an outer body of water or of the interior type which is a connection from a system carrying sewage to either a combined sewer or a storm water conduit. Exterior overflows receive sewage from the intercepting system only during severe storm conditions. Regulators and tide gates operate in conjunction with these overflows. The regulators, operated by floats, shut off the flow in a tributary sewer when the flow in the main sewer reaches a predetermined elevation, causing the sewage to discharge through an overflow.

When the system is surcharged, the limited capacity of the tunnel to Squantum determines the capacity at which it is practicable to operate the pumps at the Calf Pasture and sewage is discharged through the overflows.

b. Leakage of Salt Water into the System: Records show that in the early years of the operation of the Boston main drainage system, about 2.3 million gallons of salt water per day, or about 11.5 percent of the flow, entered the interceptors. Records taken during recent years at the Calf Pasture pumping station indicate a chloride content of about double this percentage figure. While it may be assumed that part of the increase is caused by the discharge of industrial wastes of high salt content into the sewer, the large number of tide gates installed in the various overflows are conceded to be the source of the leakage of a substantial volume of salt water into the system. This intake reduces the capacity of the system for carrying sewage and storm water and increases the cost of operation by requiring a greater load on the pumps at the Calf Pasture pumping station.

Records of the sewer division show the following distribution of tidegates in the system by area and by type, representing locations that must be regularly inspected by the main drainage forces.

Area	Top Hung	Side Hung (set)	Weir	Butterfly	Penstock	Backwater
City Proper - East Side	30	27	0	1	1	1
City Proper - West Side	6	20	0	2	5	0
Roxbury District	12	5	1	0	1	2
South Boston District	11	30	0	0	0	1
East Boston District	9	13	0	0	0	0
Charlestown District	2	18	1	1	1	1
Brighton District	4	10	1	0	4	1
Dorchester District	16	10	0	0	1	4
Totals	90	133	3	3	12	9

Many of these gates, particularly the side hung type, are faulty in operation and frequently fail to close after heavy storm intake into the system has forced them to open to permit discharge into the overflows. Pieces of lumber, branches, or other obstructions become wedged in the openings behind the gates or frequently the chain from the gate to the weight that should close the gate when functioning properly will snap resulting in the gate swinging free on its hinges. It is possible for a considerable volume of sea water to enter the interceptors after a heavy storm until an inspection can be made of all known trouble spots and repairs completed where necessary.

A program of replacing many of the side hung gates in the system with a more efficient design should be undertaken. Although gates are replaced frequently and adjusted constantly as

the result of continuous inspection by the engineer of main drainage, it is believed that replacement of the side hung type by top hung units where possible would result in fewer faulty closings and would reduce the salt water leakage into the system. No accurate estimate has been prepared by the sewer division as to the cost of replacing troublesome tidegates with an improved design but an estimate of $975,000 has been prepared to cover the rebuilding of sewer overflows.

c. Deposit of Silt and Other Foreign Matter in the Interceptor Sewers: The sewer division does not follow a predetermined program for cleaning the lateral sewers or the interceptors of the Boston main drainage system. Crews assigned to sewer cleaning, work on a complaint basis or confine their activities to those sewers that have become obstructed to the point of causing flooding. The interceptors are known to contain deposits of silt and other foreign matter to the point that their carrying capacity is reduced to a marked degree. The division engineer recognizes this condition and recommends the expenditure of the necessary funds to thoroughly clean the interceptors and to restore the carrying capacities for which they were designed.

d. Maintenance Schedule Covering Four Months' Period: The records of the foreman of the maintenance crews for the Boston main drainage district for the period from June 28, 1948 to October 29, 1948, inclusive, shows the following work performed on the interceptors and appurtenances:

Work Performed	Number
Tidegates examined	163
Tidegates oiled and scraped	51
Tidegates adjusted and repaired	37
Tidegates rehung	6
New tidegates hung	8
Tidegates removed	9
Tidegate chambers cleaned	16
Tidegate chambers flushed	1
Tidegates closed	37
Sumps examined	137
Sumps freed	55
Sumps flushed	5
Sumps cleaned	1
Regulators examined	34
Regulators freed	14
Regulators flushed	10
Regulator chambers cleaned	2
Regulators oiled and greased	3
Overflows cleaned	1
Overflow outlets cleaned	1
Overflows flushed	1
District sand catches examined	1

Work Performed	Number
Butterfly gate (Copley Square) opened	2
Butterfly gate (Copley Square) closed	1
Penstock gate oiled	1
Manholes cleaned	1
Marginal conduit tidegates examined	8
Marginal conduit tidegates chambers cleaned	2
Union Park Street pumping station cleaned	13
Summer Street pumping station cleaned	15
Catch basin connections, freed and flushed	3
Entire system inspected by engineer of main drainage	5

7. Problem of Sewage Disposal

a. Study of the Problem: Exhaustive reports have been filed with the Massachusetts General Court on the subject of the disposal of sewage of the City of Boston and of the metropolitan area. For a technical discussion of the problem, reference is made to House Bill 1600 dated December 1936 and to House Bill 2465 dated June 15, 1939. The former represents the report of the Special Commission on the Investigation of the Discharge of Sewage into Boston harbor and its tributaries as established by Chapter 42 of the Resolves of 1935 (revised and continued by Chapters 5 and 36 of the Resolves of 1936) and the latter the report of the Special Commission Investigating Systems of Sewerage and Sewage Disposal in the North and South Metropolitan Districts and the City of Boston under Chapter 79 of the Resolves of 1938. The reports of these commissions resulted in the enactment of Chapter 512 of the Acts of 1939 of the General Court of Massachusetts which makes additional provisions for the sewage disposal needs of the north and south metropolitan districts by authorizing and directing the following projects:

(1) Construction of a storm overflow conduit on the northerly side of the Charles River

(2) Construction of storm overflow conduits on the southerly side of the Charles River

(3) Construction of a sewage treatment plant and appurtenant works at Nut Island in the City of Quincy.

(4) Provision of sludge disposal equipment for the south metropolitan district

(5) Construction of an extension of the north metropolitan relief sewer from East Boston to Deer Island, including a pumping station and appurtenant works at East Boston.

(6) Disposal by the Metropolitan District Commission of the sludge of the sewage treatment plant of the Boston main drainage system upon completion of this plant by the City of Boston.

b. Purposes of Sewage Treatment: While the results of analyses show that the discharge of sewage from the Boston main drainage district into Boston harbor does not, except in Fort Point Channel, reduce the dissolved oxygen in the harbor waters to such an extent as to result in a nuisance, the overflow of sewage along certain areas of the water front causes conditions objectionable in waters used for bathing and boating. As sewage is discharged at Moon Island, large areas of sleek and objectionable floating substances are present which, under certain conditions of wind and tide, reach shores and beaches inside the Boston harbor area.

It is believed that annually between 5,000,000 and 6,000,000 persons use the beaches along the Boston water front. The state department of public health makes frequent bacterial examinations of samples of the water collected at these beaches and from the vicinity of sewer overflows. It is rarely necessary to close public beaches to bathing. Examinations of water samples, however, indicates that there is a danger to public health when bathing is permitted in the vicinity of sewer outlets.

The sewer division is developing plans for a treatment plant so that the effluent discharged from the Moon Island outlet will not reduce the oxygen in adjacent waters by the decomposition of putrescible organic matter and to remove from the sewage as much of the suspended solids, grease and floating matter as possible to prevent the objectionable condition arising from the release of this material into the harbor waters. Funds have not been provided for the execution of this program.

The construction of treatment plants will not eliminate the conditions causing the pollution of the harbor and tributary streams so long as the overflow of sewage continues due to the inability of the sewerage systems to dispose of the large amounts of storm water (with the sanitary sewage) during periods of heavy run-off.

c. Need for Uniform Treatment of Sewage Discharged into Boston Harbor: The ultimate objective of legislation and civic efforts to eliminate the discharge of untreated sewage into Boston harbor is to reduce the pollution of the harbor waters and tributary streams to the greatest practical extent. It must be recognized that the efforts of the public works department of the City of Boston constitute only part of the solution. The efforts of the Metropolitan District Commission are of even greater importance and because the problem is a metropolitan one, there is a strong argument to favor control of Boston's interceptor sewers and its sewer disposal facilities by this same state agency that now handles the disposal of sewage of the communities adjacent to the City of Boston.

d. Essentiality of Sewage Treatment: The Massachusetts General Court has passed the enabling legislation to authorize the Metropolitan District Commission to provide facilities for the treatment of sewage that it discharges into Boston harbor. The City of Boston has not been directed to cease and desist from discharging untreated sewage into Boston harbor. However, it is clear that it is the intent of state officials having jurisdiction over the problem, of adjacent communities whose territories border on Boston harbor, and of the general public interested in the esthetic value of the harbor, as well as the maximum utilization of its bathing and boating facilities, to improve conditions by eliminating pollution of the harbor, its tributary streams, and tidal estuaries and by reducing the amount of grease and other floating matter that is discharged into the harbor under present disposal methods. A not insignificant amount of thisfloating matter finds its way to the various beaches inside and outside the harbor.

There is, further, the indication that the potential danger to public health resulting from pollution of the harbor waters will tend to increase rather than decrease, that recreational expansion of Boston Harbor is being handicapped, and that present conditions of sewage discharge present a threat to property values in the area.

The engineering studies that have been conducted on the problem, moreover, seem to indicate clearly the degree of treatment necessary and practical. The extent of purification of the sewage discharged into the harbor may be determined by limiting the pollution of the effluent to the extent of pollution of the harbor waters into which it is discharged. It is obviously not the proper function of the public works department or of the Metropolitan District Commission to attempt to purify the harbor. Pollution from boats and vessels and from uncontrollable sources as well as from the sewer overflows will continue so partial treatment of the effluent by sedimentation and by skimming for the removal of grease and other objectionable suspended and floating matter is regarded as satisfactory by engineering groups that have studied the problem and who have reported on their findings and recommendations.

8. Transfer of Interceptor Sewers and Sewage Disposal Facilities of the City of Boston to the Metropolitan District Commission

According to the engineer's report appearing in House Bill 1600, the Boston main drainage system was designed to provide for a population of 800,000, and for a dry weather flow of sanitary sewage at the daily rate of 75 gallons per capita. The population served in this district is estimated to currently in the neighborhood of 500,000 persons. The per capita rate of sewage, on the basis of 500,000 persons, is currently somewhat in excess of 150 gallons per day; in terms of the estimated population of 800,000 used as the basis of designed capacity, this rate would be between 95 and 100 gallons. It is unlikely that there will be any substantial increase in the resident population of the City connected to the Boston main drainage district but adequate provision must be made for a very large transient population which visits Boston daily. As long ago as 1927, a traffic count indicated that approximately 825,000 people moved in and out of the business district of the City each day. It is believed that the figure is currently in excess of 900,000 persons. Industrial waste and sewage from the greater part of this temporary population is discharged into the sewers of the district.

The Boston metropolitan district, as defined by the U. S. Bureau of the Census in 1940, comprises 83 municipalities having a total population of approximately 2,350,000. Of the total, some 34 percent reside within the central city and 66 persent outside. Compared to similar figures of the 1930 census, the district increased 1.8 percent in population, Boston decreased 1.3 percent. and the number of persons living outside the central city increased 3.5 percent.

For nearly 75 years the Boston metropolitan district has been the fourth or fifth largest urban district of the country. Boston was the first of the larger cities of the United States to develop as the center of an important metropolitan area.

The Metropolitan District Commission provides facilities or services to 43 cities and towns including Boston, all of which are within the Census Bureau's Boston metropolitan district. The 1940 census figures indicated that these communities had a population of 1,980,221, a total area of 472 square miles, and an average density of population of 4,342 persons per square mile of land area.

The Metropolitan Sewerage Commission was created in 1889, largely as the result of an exhaustive report issued the same year by the State Board of Health on the need for facilities to dispose of sewage from the communities surrounding the City of Boston. The Boston main drainage system had been completed by that date following the recommendation of a municipal commission established to study the problem.

The entire history of progress in solving the sewage disposal and drainage problems of the Boston Basin which is drained by the Mystic, Charles, and Neponset Rivers indicates that the topographical character of the area rather than the various municipal boundaries must determine the policies that should be adopted for the greatest

benefit of a population of nearly two million persons. It is, therefore, the opinion of the authors of this report that the interests of the City of Boston and of the metropolitan area would be best served by a transfer of responsibility for operating and maintaining the interceptor sewers and the disposal plant of the Boston main drainage system to the Metropolitan District Commission.

The Metropolitan District Commission prorates the cost of sewerage operations against the various member municipalities according to the provisions of law and contract.

The transfer of the responsibility for maintaining main and interceptor sewers of the Boston main drainage system and of the disposal facilities of the system to the Metropolitan District Commission appears to be merely an extension of the basic principle on which MDC was founded - that of pooling the physical and financial resources of adjoining municipalities that are devoted to providing services in which the several communities are interested, at less cost to the respective communities.

The determination of the formula by which the City of Boston as well as other communities in the Boston metropolitan district would be assessed their proportionate share of the cost of maintaining these main and interceptor sewers and of operating and maintaining sewage disposal facilities that are a part of the Boston main drainage district will require careful study. It may be necessary to determine the number of residents of each neighboring community who move into Boston daily. This procedure is now followed in principle in assessing the various communities their proportionate share of the deficit of the Metropolitan Transit Authority.

The amounts to be paid by the municipalities for metropolitan assessments are assessed and collected by the state treasurer and the receiver general.

The various communities served by sewerage facilities of the Metropolitan District Commission are assessed a proportion of construction costs based on the value of their taxable property and a proportion of maintenance cost based on their population. It is a matter for considerable further study as to whether population is the proper method of assessing cost of maintenance and operation of facilities of the Boston main drainage district if there are transferred to the jurisdiction of the Metropolitan District Commission.

9. Expenditures and Expenditure Requirements

a. Ten-Year Totals: The expenditures of the sewer division of the public works department fall into two main groups. Funds for maintenance and for work other than sewer construction, is provided for in the annual budget of the public works department. Sewer construction is financed by borrowing.

Expenditures of the division for 1938-1947, inclusive, were as follows:

	Maintenance	Construction	Total	Percent of Total
1947				
Total expenditures	$547,931.80	$873,720.96	$1,421,652.76	100
Personal services	377,202.65	177,709.05	554,911.70	39.1
Contractual services	120,138.19	696,011.91	816,150.10	57.4
Equipment and supplies	38,505.66		38,505.66	2.7
Special items	12,085.30		12,085.30	0.8
1946				
Total expenditures	515,283.24	423,885.14	939,168.38	100
Personal services	340,215.41	113,965.33	454,180.74	48.3
Contractual services	136,981.48	309,919.81	446,901.29	47.6
Equipment and supplies	30,709.01		30,709.01	3.3
Special items	7,377.34		7,377.34	0.8
1945				
Total expenditures	398,402.56	392,460.49	790,863.05	100
Personal services	235,090.36	145,472.06	380,562.42	48.1
Contractual services	113,259.66	246,837.36	360,097.02	45.5
Equipment and supplies	44,033.34	151.07	44,184.41	5.6
Special items	6,019.20		6,019.20	0.8
1944				
Total expenditures	349,291.87	322,628.83	671,920.70	100
Personal services	228,811.04		228,811.04	34.1
Contractual services	82,774.31	322,628.83	405,403.14	60.4
Equipment and supplies	29,631.55		29,631.55	4.4
Special items	8,074.97		8,074.97	1.1
1943				
Total expenditures	363,153.96	348,116.36	711,270.32	100
Personal services	223,467.56	144,962.24	368,429.80	51.8
Contractual services	73,465.77	203,154.12	276,619.89	38.9
Equipment and supplies	55,730.00		55,730.00	7.8
Special items	10,490.63		10,490.63	1.5
1942				
Total expenditures	370,363.30	369,924.54	740,287.84	100
Personal services	248,361.26	11,496.08	259,857.34	35.1
Contractual services	64,528.52	358,414.71	276,619.89	57.1
Equipment and supplies	48,626.23	13.75	48,639.98	6.6
Special items	8,847.29		8,847.29	1.2

1941

	Maintenance	Construction	Total	Percent of Total
Total expenditures	$435,257.39	$226,471.39	$661,728.78	100
Personal services	286,580.68	72,975.69	359,556.37	54.4
Contractual services	64,691.33	141,953.77	206,645.10	31.2
Equipment and supplies	53,966.58	11,541.93	65,508.51	9.9
Special items	30,018.80		30,018.80	4.5

1940

Total expenditures	762,785.41	175,543.00	938,328.41	100
Personal services	343,610.31		343,610.31	59.8
Contractual services	66,359.44	175,543.00	241,902.44	25.8
Equipment and supplies	42,446.80		42,446.80	4.5
Special items	310,368.86		310,368.86	33.1

1939

Total expenditure	567,939.04	384,538.48	952,477.52	100
Personal services	352,878.69		352,878.69	37.1
Contractual services	74,872.79	384,538.48	459,400.59	48.2
Equipment and supplies	29,800.36	10.68	29,811.04	3.1
Special items	110,387.20		110,387.20	11.6

1938

Total expenditures	502,302.99	481,525.02	983,828.01	100
Personal services	371,063.14	260,358.62	631,421.76	64.1
Contractual services	78,046.18	107,582.82	185,629.00	18.9
Equipment and supplies	48,748.58	113,583.58	162,332.16	16.5
Special items	4,445.09		4,445.07	0.5

b. Construction Requirements: Comment has been made in an other section of this report on the construction projects contemplated by the sewer division as a part of its recommended post-war program. A detail examination of the projects under consideration has not been made in the course of this study but from a sampling of the recommended improvements to the system, the proposed projects appear desirable and necessary. The sewer division has adopted the following classification to show the relative importance of projects that are recommended:

Class A

Rebuild old sanitary or combined sewers that are constructed of wood, wood and brick, brick and slate, single ring of brick, or sewers that are in poor structural condition.

Class B

Rebuild wooden sewer overflows and overflows of other materials that are in poor structural condition.

Class C

Construct sanitary sewers and surface drains in streets where houses are now served by cesspools, where cost of work is not excessive.

Class D

Construct sanitary sewers, same as Class C where cost of work appears to be excessive.

Class E

Construct surface drain conduits to cover open brooks.

Class F

Construct surface drains, and sanitary sewers if needed, to complete sewerage works in streets in anticipation of street construction.

Class G

Construct sanitary sewers and surface drains where systems have only temporary connection.

A summary of recommended projects by classification and by district follows:

Estimated Construction Cost

District	Class	Plans Completed	Plans Not Completed	Total
Dorchester	A	$	$ 92,000	$ 92,000
City Proper	A	230,525	313,300	543,825
Roxbury	A	78,381	485,000	563,381
Charlestown	A		58,600	58,600
East Boston	A		114,400	114,400
South Boston	A		455,000	455,000
Totals	A	$308,906	$1,518,300	$1,827,206
Dorchester	B		24,000	24,000
Brighton	B		16,100	16,100
City Proper	B		450,200	450,200
Charlestown	B		319,000	319,000
East Boston	B		84,250	84,250
South Boston	B		82,000	82,000
Totals	B	0	$975,500	$975,500

District	Class	Plans Completed	Plans Not Completed	Total
Dorchester	C	$ 4,000	$	$ 4,000
Hyde Park	C	3,000	13,500	16,500
West Roxbury	C	90,500	47,800	138,300
Totals	C	$ 97,500	$ 61,300	$ 158,800
Dorchester	D	43,000		43.000
Hyde Park	D		198,500	198,500
Totals	D	$ 43,000	$ 198,500	$ 241,500
Roxbury	E		4,534,000	4,534,000
Dorchester	E	283,000	160,000	443,000
Hyde Park	E		1,018,000	1,018,000
West Roxbury	E	153,600	443,000	596,600
Brighton	E	198,400		198,400
Totals	E	$ 635,000	$6,155,000	$ 6,790,000
Dorchester	F	73,000	263,000	336,000
Hyde Park	F	32,000	250,000	282,000
West Roxbury	F	14,000	23,000	37,000
Brighton	F		10,700	10,700
Totals	F	$ 119,000	$ 546,700	$ 665,700
Roxbury	G	20,309		20,309
GRAND TOTALS ALL CLASSES		$1,223,715	$9,455,350	$10,679,065

The division does not have a current detailed estimate of the cost of the proposed treatment plant which was originally estimated to cost in the neighborhood of $3,250,000. It is believed that this plant will cost over $5,000,000 at prevailing prices of labor and materials. Its construction should not be deferred because of the importance of uniform treatment of sewage discharged into Boston harbor as discussed in another section of this report.

c. Maintenance Requirements: At the present pay schedules in effect for employes assigned to the sewer division of the public works department, the annual payroll cost of the division for the number of positions authorized in the appropriations for the year 1948 is at the rate of approximately $687,000. Of this amount, over $375,000 is chargeable to maintenance representing salaries and wages of employes assigned to the district yards, maintenance inspection, main drainage group and other organization units not concerned with construction.

In view of the amount of sewer cleaning that is required to restore the original carrying capacity of the interceptors, it would appear necessary to expend for maintenance an amount at least equal to 1947 expenditures for this purpose. Total maintenance expenditures in 1947 were about $550,000.

d. Combined Construction and Maintenance Requirements: It is recommended that the capital outlay program be carried out over a ten-year period. Exclusive of the construction of the treatment plant, these expenditures would amount to nearly a million dollars a year. In the absence of a current detailed estimate of the cost of the treatment plant, the figure of over $5,000,000 is used. Therefore, as presently constituted, the Boston main drainage system should be improved by capital outlays totaling over $15,000,000 over the next decade.

Maintenance expenditures will vary over this same period but until the interceptors are cleaned, it would appear inadvisable to reduce expenditures for maintenance of the system to below $550,000 a year.

Therefore, total expenditures for construction and maintenance requirements should be approximately two million dollars a year for the next ten years.

If the interceptors and disposal facilities of the Boston main drainage system are transferred to the jurisdiction of the Metropolitan District Commission, as recommended elsewhere in this report, expenditure requirements for both construction and maintenance by the public works department would, of course, be substantially reduced.

10. Summary of Savings

It would be difficult, if not impossible, to evaluate the savings that would accrue to the City of Boston if all of the recommendations contained in this report were put into effect. The savings that would result from the adoption of the proposed organization structure should be substantial. It is recognized by the authors of this report that an organization is made up of people, many of whom have had long service with the City, and that certain compromises may be necessary to fit the abilities of the present staff to the organization plan proposed. However, it is believed that the present employes are capable of carrying out the recommendations.

Certain of the recommendations are more specific and capable of early adoption and can be evaluated within reasonable limits of accuracy.

The reorganization of district maintenance yards as recommended in this report should permit a continuance of service at its present level of quality with a reduction in staff of 20 employes for an annual payroll saving of approximately $50,000.

A reduction of five positions at the Calf Pasture pumping station, a reduction in size of catch basin cleaning crews from three to two, the elimination of at least one clerical position by simplifying the records that are maintained, and the elimination of two positions in the maintenance inspection group (with allowance for the three cars needed) would result in an additional saving of approximately $20,000 annually.

The assignment of catch basin cleaning to City forces, the discontinuance of the policy of accomplishing this work by contract labor, and the assignment of one driver and one station wagon to transport crews to both the Calf Pasture and the Moon Island storage basins would result in further savings that cannot be calculated.

Considering the improvements that would result from the proposed organization structure savings of approximately $100,000 a year should be realized from the adoption of the recommendations contained in this report. Such savings are estimated on the basis of maintaining the present standards of service. However, it is believed that some improvements in service are warranted such as the long-neglected sewer cleaning program. For this reason, the recommendations made in this report do not call for any immediate reduction in the staff of the sewer division.

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